

## 5. Anticipating Change

The preceding chapters have described an expansive methodology for building software-based products based on disciplined engineering practices and the product family concept. The DsE methodology targets the producibility vision for a fundamental change from the traditional concept of the tool-supported building of unique, hand-crafted products. This chapter considers how potential technological advances could increase the effective capabilities of this methodology. These potential advances target intrinsic weaknesses of existing practices, methods, and technology as well as possibilities for more fundamental innovations leading toward producibility.

The increasing relevance and importance of software capabilities to all aspects of modern life have led to enormous advances in the complexity of software-based products that can now be built. In turn, this dependence on software has increased the urgency of making software more capable, more reliable, more sustainable, and less costly. Many opportunities exist for achieving responsive improvements both in how software is built and in the breadth and complexity of its effective capabilities.

Software development as a science, engineering, and manufacturing discipline is continuing to change and mature, having been widely applied only since the 1950s. Advances in both theory and practice are needed that will either enable or motivate changes in how software-based products are built, to improve both process quality (productivity and predictability) and product quality. Likely near- to mid-term advances that could enhance the practice of software-based product development are considered here in four categories:

- Technical challenges in developmental and operational practices
- Predictive analytics for more predictable product properties
- Evolving and emerging computational technologies
- Data science, artificial intelligence, and machine learning capabilities